Case Report

Postoperative spinal epidural hematoma following therapeutic anticoagulation: case report and review of literature

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Abstract: While the incidence and risk factors of pulmonary embolism (PE) and deep vein thrombosis (DVT) following spinal surgery have been well studied, the treatment of such thromboembolic disease in patients after spine surgery remains controversial. When initiating therapeutic anticoagulation after spine surgery, clinicians must weigh the catastrophic risk of a PE against the risk of bleeding complications associated with anticoagulation therapy. Here we report the case of a 56-year-old male who presented with symptoms of spinal cord compression secondary to metastatic renal cell carcinoma (RCC). An inferior vena cava (IVC) filter was inserted preoperatively and urgent decompression at the thoraco-lumbar region was performed. Therapeutic clexane was started on postoperative day (POD) 7 and he was discharged. On POD 8, he was readmitted following acute bilateral lower limb paralysis. Magnetic resonance imaging (MRI) revealed a large posterior spinal epidural hematoma with severe compression of the conus at L1 level. Urgent posterior decompression was performed but subsequent recovery was slow and incomplete. His power improved gradually over the right lower limb with attainment of grade 4/5 motor power but still had hemiparesis on his left lower limb upon discharge out of hospital. This case highlights the risk of starting therapeutic anticoagulation following spinal surgery. Prior to starting treatment, the clinician must consider the appropriate dose, timing and alternatives available to avoid unnecessary complications.

Keywords: Spinal decompression; anticoagulation; epidural hematoma; venous thromboembolism (VTE); neurological deficit

Submitted Aug 04, 2020. Accepted for publication Oct 23, 2020.
doi: 10.21037/jss-20-636
View this article at: http://dx.doi.org/10.21037/jss-20-636

Introduction

Spinal epidural hematoma requiring surgical evacuation is a rare but severe complication of spine tumor surgery with an incidence of 0.30% (1). Previous studies have shown that patients undergoing major elective orthopaedic surgery have a significant risk of developing deep vein thrombosis (DVT), which may require intervention to prevent a fatal pulmonary embolism (PE) (2-4). In addition, the cardiac stress produced by the general anesthesia required for major spine surgery can cause myocardial ischemia and/or infarction, thus necessitating perioperative anticoagulation (5).

However, prophylactic anticoagulation is controversial and many surgeons may instead prefer mechanical prophylaxis to avoid the morbidity and bleeding risk associated with anticoagulation after spine surgery (6). In established cases of PE that may be potentially life threating following spinal surgery, therapeutic anticoagulation with adjusted dose heparin or a low molecular weight heparin

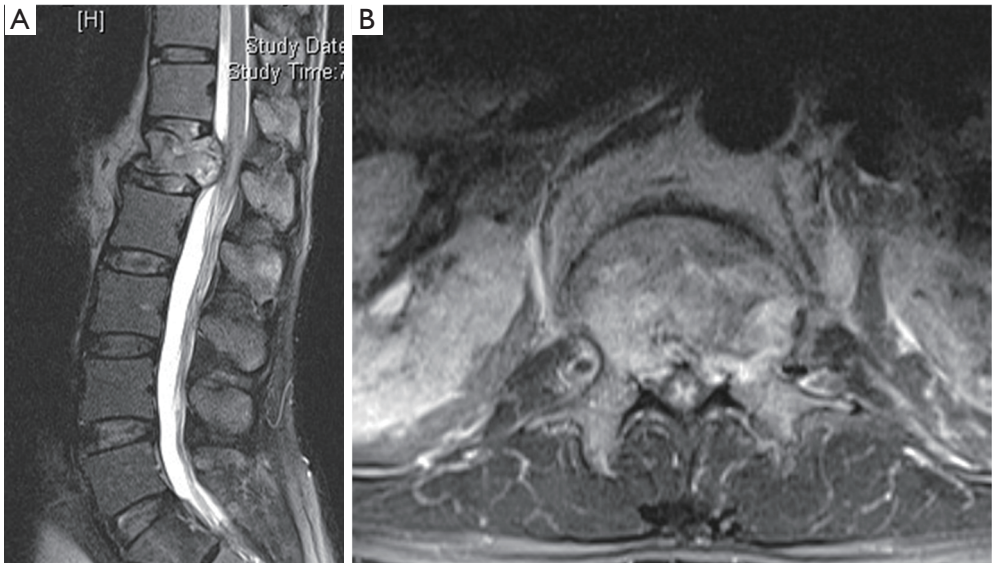

Figure 1 (A) Sagittal and (B) Axial MRI images of the thoracolumbar spine showing conus compression.

(LMWH) may be required to prevent further propagation of the clot. However, this must be balanced with the risk of complications including spinal hematoma, wound breakdown and cord compression (7).

Here we present a rare case of spinal epidural hematoma following the administration of therapeutic clexane (enoxaparin) after spinal surgery and review the current guidelines on the initiation of therapeutic anticoagulation after spine surgery. We present the following case in accordance with the CARE reporting checklist (available at http://dx.doi.org/10.21037/jss-20-636).

Case presentation

A 56-year-old man with a medical history of renal calculi was noted to have an incidental (4 cm × 5 cm) left renal mass on computer tomography (CT) scan, but defaulted follow-up on the lesion for 7 months. He presented with 5 weeks of progressive bilateral lower limb weakness, sensory loss and incontinence. He was unable to walk, and was wheelchair bound. On admission, the power of his lower limbs was weak, (Medical Research Council, grade 3 power for L2 and L3, grade 4 for L4–S1). Sensation was also reduced in the L2 dermatome and the anal sphincter tone was lax.

Urology review indicated a high suspicion for renal cell carcinoma (RCC) with likely metastases to the spine and causing the left renal vein thrombus. He was started on dexamethasone and scheduled for an inferior vena cava (IVC) filter insertion for embolus prevention.

On day 2 of admission, his neurologic status worsened (MRC, grade 1 power for L2 and L3, grade 2 power for L4–S1). Blood investigation showed mildly elevated inflammatory markers (white blood cell, 8.06; erythrocyte sedimentation rate, 52; C-reactive protein, 71.4), low prostate specific antigen, 0.79 and normal urine formed elements and liver function. His preoperative hemoglobin was 11.2 with normal coagulation profiles [activated partial thromboplastin time (APTT) 29.3, partial thromboplastin time (PTT) 13.0 and international normalised ratio (INR) 1.2]. Magnetic resonance imaging (MRI) revealed an acute compression fracture of the L1 vertebral body with compressive myelopathy of conus medullaris (*Figure 1*). CT scan showed a left renal carcinoma (9.4 cm × 8.1 cm) with filling defect in left renal vein and IVC (*Figure 2*).

The patient underwent a complete L1 laminectomy, partial T12 laminectomy, T11–L3 stabilization and posterior lateral and inter-facet fusion. The surgery was uneventful with 500 mL of blood loss, and there were no complications or dural tear intraoperatively.

Between postoperative day (POD) 1–6, the patient showed marked improvement in lower limb neurology. He was able to ambulate with a walking frame and with minimal assistance. Anal sphincter control had also return. His surgical wound was dry, and the surgical drain was removed without issues on POD 4. He was kept on mechanical thromboprophylaxis daily following his operation.

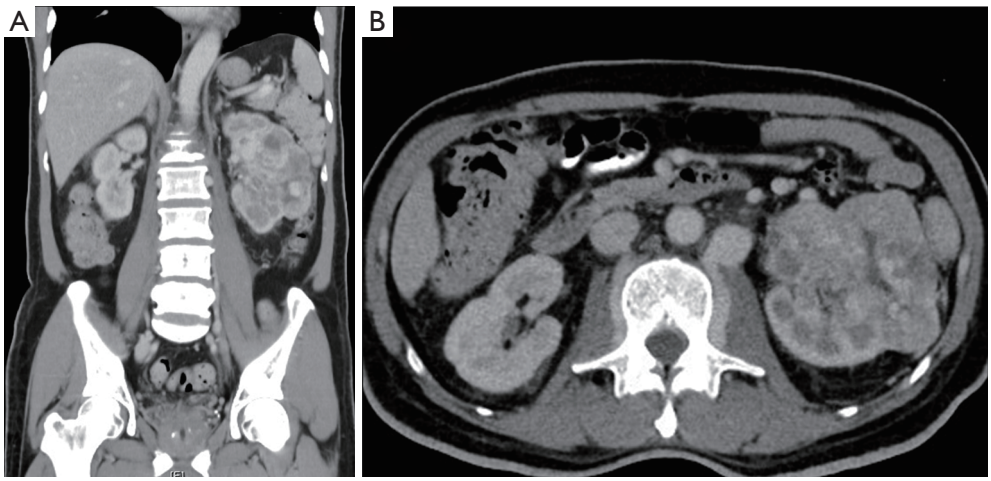

Figure 2 (A) Coronal and (B) axial CT images of the abdomen showing the renal mass and renal vein thrombosis.

In view of persistent left renal vein thrombus, therapeutic subcutaneous clexane was initiated at 80 mg (1 mg/kg) twice daily, as per hematology, due to the following indications: (I) prothrombotic state from metastatic disease, (II) prevention of thrombus propagation, and (III) prevention of IVC filter blockage. Clexane was started on the night of POD 6 and he was subsequently discharged on the night of POD 7.

In the evening of POD 8, the patient was readmitted with progressive paralysis of his lower limbs. Clinical examination revealed motor power of grade 1 from L2–L3 and grade 0 from L4–S1 with parasthesia over the left L3–L5 dermatome. Bilateral plantars were upgoing. There was perianal anaesthesia and lax anal tone.

MRI scan revealed an interval development of a large posterior epidural and subcutaneous hematoma, with severe compression of the conus at L1 level (*Figure 3*). X-ray of thoracolumbar spine showed no periprosthetic loosening and IVC filter being *in situ*.

Urgent posterior decompression of hematoma and exploration was performed on the night of admission. Intravenous protamine (50 mg) was given to reverse effects of clexane. Intraoperatively, a large haematoma was noted around the previous surgical site with generalised bleeding and 1.5 L of blood loss. Postoperatively, patient was kept on mechanical thromboprophylaxis strictly.

The recovery of the patient's neurology following the second operation took a significantly longer duration. His power improved gradually over the right lower limb with attainment of grade 4/5 motor power but still had hemiparesis on his left lower limb upon discharge out of hospital.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

Discussion

Surgical Site Hematomas is a known complication especially in patients who are already on antiplatelet or anticoagulation therapy. For this, clear guidelines exist to help the clinician reduce this complication. However, there is a paucity of literature regarding when to initiate therapeutic anticoagulation for high risk patients in the early post-operative period to prevent the risk of a fatal PE (5,8,9). This case report highlights the possible complication of postoperative spinal epidural hematoma associated with the initiation of therapeutic clexane (enoxaparin, a LMWH) after spine surgery.

Decortication of the spine and the large potential dead space created during exposure predisposes to haemorrhagic complications and hematoma formation after spine surgery (10). While most postoperative spinal epidural hematomas are clinically asymptomatic, the rare hematoma that causes significant spinal cord compression can result in devastating neurologic consequences—commonly bilateral lower limb paraparesis, paraplegia or cauda equina syndrome (11,12).

The management of thromboembolic complications is difficult in spine surgery patients because of the bleeding risks associated with initiating anticoagulation (4,13). Several questions remain unanswered regarding the guidelines of

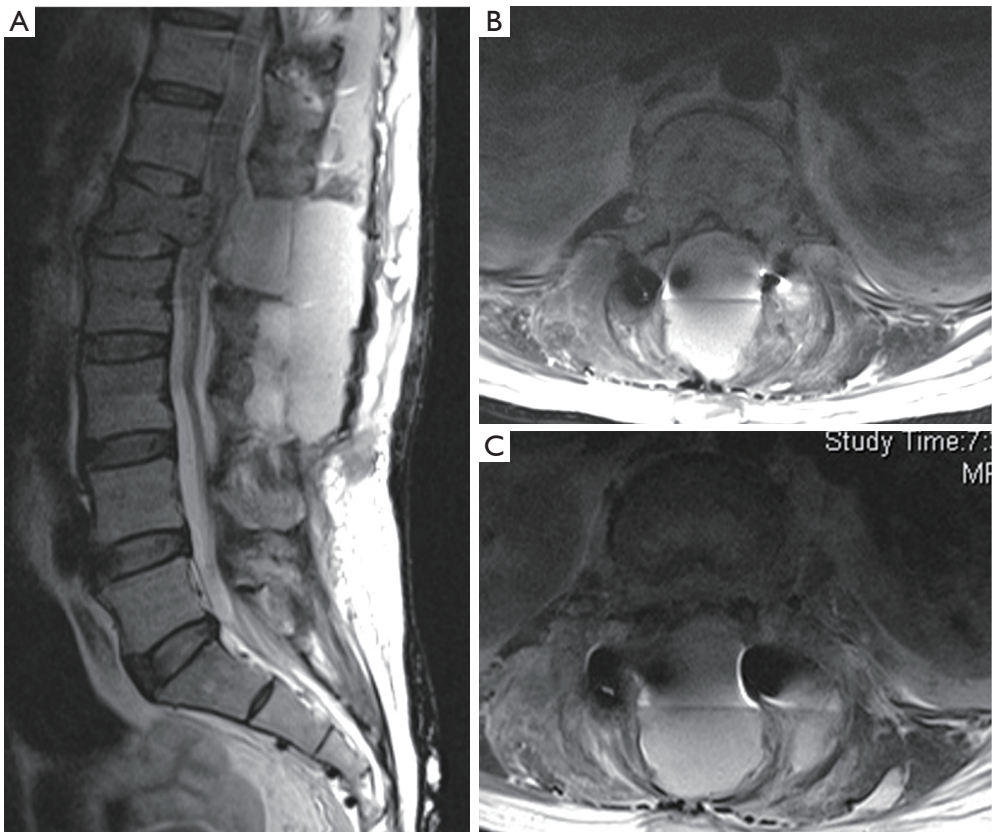

Figure 3 (A) Sagittal and (B,C) axial MRI images of the thoracolumbar spine showing the large epidural hematoma with severe cord compression in the lumbar spine.

postoperative anticoagulation in spine surgery patients.

Should anticoagulation be started prophylactically for spine surgery patients?

Low risk patients

The risk of spinal epidural hematoma associated with heparinization has led many authors to advocate against pharmacological prophylaxis for routine spine surgery, particularly after decompressive laminectomy (6). According to the North American Spine Society's (NASS) Evidence-based clinical guidelines for Antithrombotic Therapies in Spine Surgery (9), most commonly performed elective spine surgeries only carry a very low risk of venous thromboembolism (VTE) and thus chemoprophylaxis may not be necessary in such cases.

High risk patients

According to the American College of Chest Physicians (ACCP) Recommendations for Spine Surgery (8), mechanical and chemoprophylaxis (Heparin or LMWH) have been recommended for patients undergoing spine surgery, especially in those with additional risk factors such as circumferential spine surgery, multiple trauma, malignancy or hypercoagulable states. In a multicentre, randomized, controlled trial by Agnelli *et al.* (14), the authors found that enoxaparin with compression stockings was more effective than compression stockings alone for the prevention of DVT after elective neurosurgery, and did not cause excessive bleeding. Hence, while low-risk patients do not require chemoprophylaxis, high-risk patients should be started on both mechanical and chemoprophylaxis to avoid the devastating consequence of a PE.

What is the dosing regimen of therapeutic anticoagulation that should be started after spine surgery?

For patients with established thromboembolic disease (e.g., DVT, PE), therapeutic anticoagulation should be initiated. Therapeutic doses of enoxaparin are typically 1 mg/kg twice

daily (as in the present case study), while the prophylactic dose is 40 mg, once daily (15). In contrast, therapeutic heparin is initiated as an intravenous loading dose followed by a 1,000 units/h infusion (16). Additionally, heparin requires close monitoring and titration of the infusion to ensure a therapeutic range of 0.3–0.7 U/mL by anti-Xa analysis (17).

More recently, LMWH (Enoxaprin) has been preferred over heparin because of its ease of use in attaining therapeutic level clinically and not requiring an infusion (18). Shiu *et al.* (19) conducted one of the only studies to evaluate outcomes of spine surgery patients undergoing therapeutic anticoagulation for thromboembolic disease. Compared to patients treated with LMWH, those treated with heparin infusion had overall higher reoperation rates due to bleeding-associated complications. The authors also found that patients with complications in the heparin group had more supratherapeutic PTT measurements compared to those without complications. Hence, the higher bleeding risk associated with heparin could be, in part, due to the greater difficulty in achieving optimal levels clinically and that it might be safer to use therapeutic LMWH to treat spine surgery patients who develop postoperative VTE. Nonetheless, it is important for clinicians to remember that LMWH still carries a risk of bleeding complications like spinal epidural hematoma, as in this case.

When should anticoagulation be started after spine surgery?

In reviewing the available literature, several factors need to be considered before initiating anticoagulation, including ensuring the wound has completely healed, a low drainage output and timing of drain removal when a drain is used, the underlying pathological condition, comorbidities, and other host factors, such as ambulatory and neurological status of each patient (9). A recent study by De la Garza Ramos *et al.* (20) found that administration of prophylactic anticoagulation between POD 1-3 for metastatic tumors of the spine significantly reduced the risk of VTE than administration on or after POD 4. However, it is important to balance the benefits of early administration of prophylactic anticoagulation with the associated risks of bleeding complications.

Cain *et al.* (7) performed one of the only other studies investigating therapeutic heparin use in patients undergoing spine surgery after PE. Intravenous heparin was started at the time of diagnosis of PE, ranging from POD 1 to 14 among the 9 patients who were included in the study. Bleeding complications occurred in 6 of the 9 patients from POD 1 to 9 but not in the remaining patients when therapeutic heparin was initiated from POD 12 to 14 (7). Likewise, in the present case study, the patient developed a spinal epidural hematoma on POD 8 after initiation of therapeutic clexane on POD 6. The existing data suggest that it might be safer to initiate postoperative therapeutic anticoagulation no earlier than from POD 10 to 14 to reduce the risk of bleeding complications.

What is the role of IVC filters as an alternative to anticoagulation after spine surgery?

The morbidity of IVC filter placement is low and should be considered as a management alternative in the treatment of patients who are at a high risk of PE after surgery (7). Previous studies (21,22) have shown that prophylactic IVC filter placement in high-risk spine surgery patients significantly reduced the odds of developing a PE as compared to control populations.

Hence, given the efficacy of IVC filters in preventing adverse complications of PE, such measures should be considered as an alternative to anticoagulation, especially in patients with an established DVT who require surgery. The additional morbidity and risks of hemorrhagic complications of anticoagulation also further account for why spine surgeons, advocate IVC filters for definitive treatment of PE in the postoperative period of spinal surgery (7).

In conclusion we have presented a case of postoperative spinal epidural hematoma associated with the initiation of therapeutic clexane after spine surgery. When initiating anticoagulation in patients who are at high risk of PE postoperatively, the clinician must balance the risk of bleeding complications (such as spinal epidural hematomas) with the devastating risk of a PE. In such cases, therapeutic anticoagulation should still be initiated as indicated, after carefully considering the choice of drug, dosage, timing and use of an IVC filter. Clinicians should subsequently be wary and monitor for the rare bleeding complications associated with such therapy so that they can be identified and addressed early, should they occur.

Acknowledgments

Funding: None.

Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at http://dx.doi.org/10.21037/jss-20-636

Peer Review File: Available at http://dx.doi.org/10.21037/jss-20-636

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/jss-20-636). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

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Cite this article as: Moorthy V, Wang JX, Tang JH, Oh JYL. Postoperative spinal epidural hematoma following therapeutic anticoagulation: case report and review of literature. J Spine Surg 2020;6(4):743-749. doi: 10.21037/jss-20-636